



US006215483B1

(12) **United States Patent**
Zigmund

(10) Patent No.: **US 6,215,483 B1**
(45) Date of Patent: **Apr. 10, 2001**

(54) **COMBINING REAL-TIME AND BATCH MODE LOGICAL ADDRESS LINKS**(75) Inventor: **Daniel J. Zigmund**, San Francisco, CA (US)(73) Assignee: **WebTV Networks, Inc.**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/099,481**(22) Filed: **Jun. 17, 1998**(51) Int. Cl.⁷ **H04N 7/10**(52) U.S. Cl. **345/327; 348/12; 348/13; 709/217**(58) Field of Search **345/327; 348/906, 348/7, 10, 12, 13, 461, 467, 473, 476, 478, 553, 563; 709/217, 219**(56) **References Cited**

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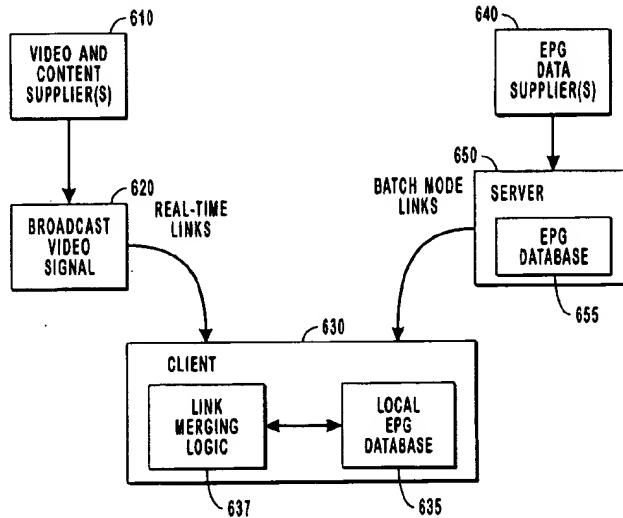
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(57) **ABSTRACT**

A method and apparatus for receiving logical address links in advance of a television program and combining such links with those that may be received in real-time during a television broadcast are provided. According to one aspect of the present invention, content associated with a television (TV) program may be automatically displayed by a client system, such as an Internet terminal or a computer equipped with a TV tuner. Prior to broadcast of a TV program, TV listing information is stored in the client system. The TV listing information includes one or more batch mode logical addresses, e.g., Uniform Resource Locators (URLs), that identify content, such as Internet content. The client system alerts the viewer of the existence of an active logical address associated with the current TV program by providing a visual indication. After the visual indication has been selected by the viewer, the client system displays the content identified by the logical address. Additionally, one or more real-time logical addresses may be received by the client system embedded in a video signal associated with the TV program. The real-time logical addresses may be embedded in either a text service channel (e.g., T1, T2, T3, T4) or a captioning service channel (e.g., CC1, CC2, CC3, CC4) of the vertical blanking interval (VBI) of the video signal. When both real-time logical addresses and batch mode logical addresses are associated with a TV program, the client system determines which to bring to the attention of the user of the client system based upon a set of predefined rules. Importantly, features of the present invention are applicable to many broadcast television (TV) systems including National Television Standards Committee (NTSC), Phase Alternate Lines (PAL), and Sequential Couleur Avec Memoire (SECAM) as well as the proposed High Definition Television (HDTV) standard.

13 Claims, 7 Drawing Sheets

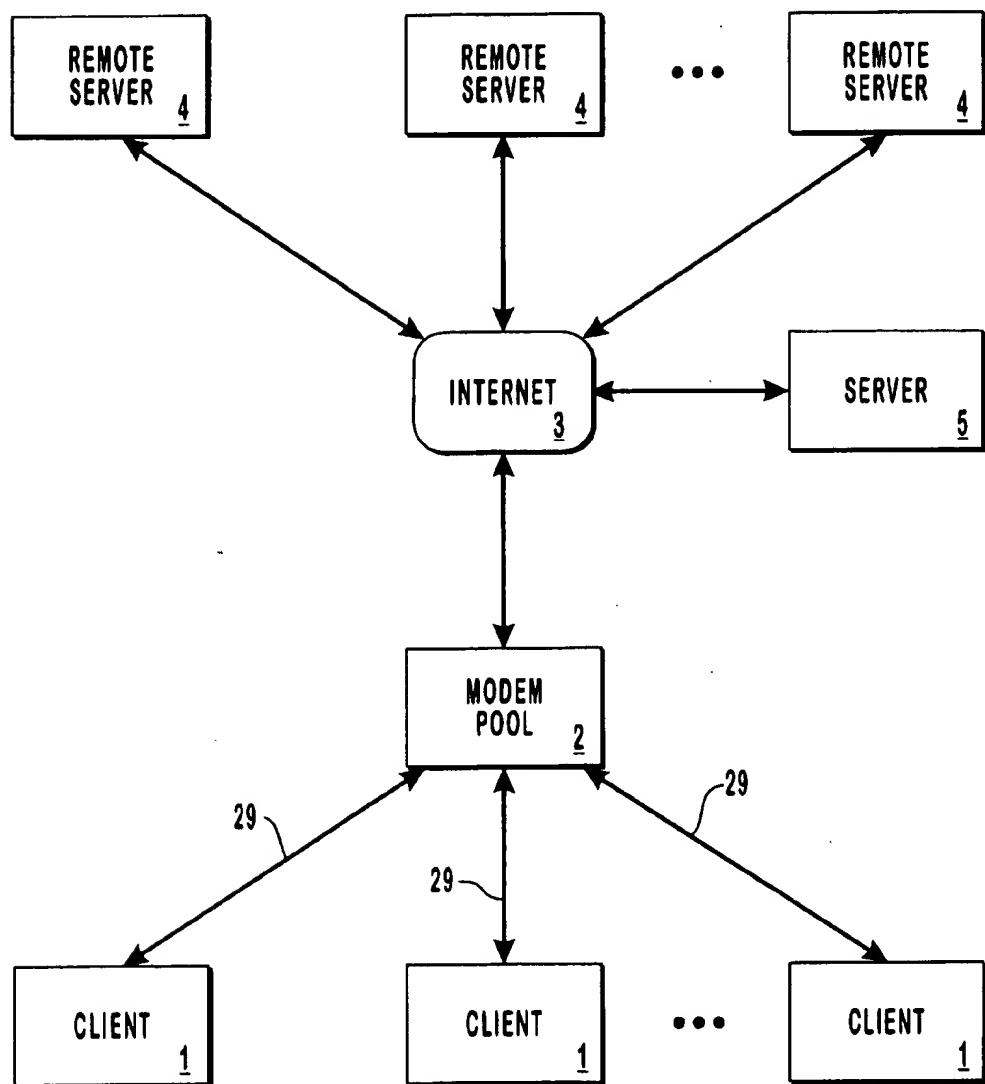


FIG. 1
(PRIOR ART)

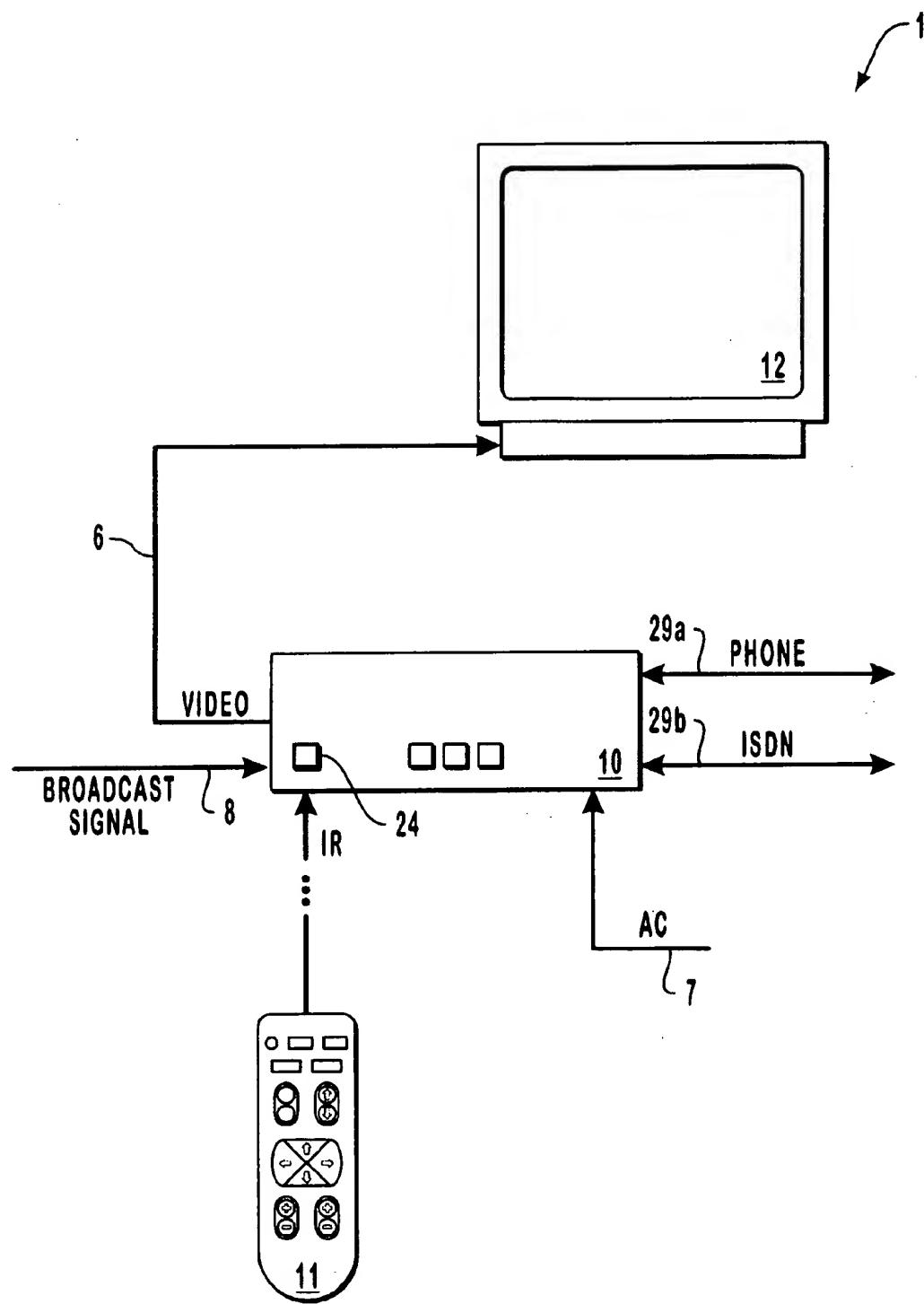


FIG. 2

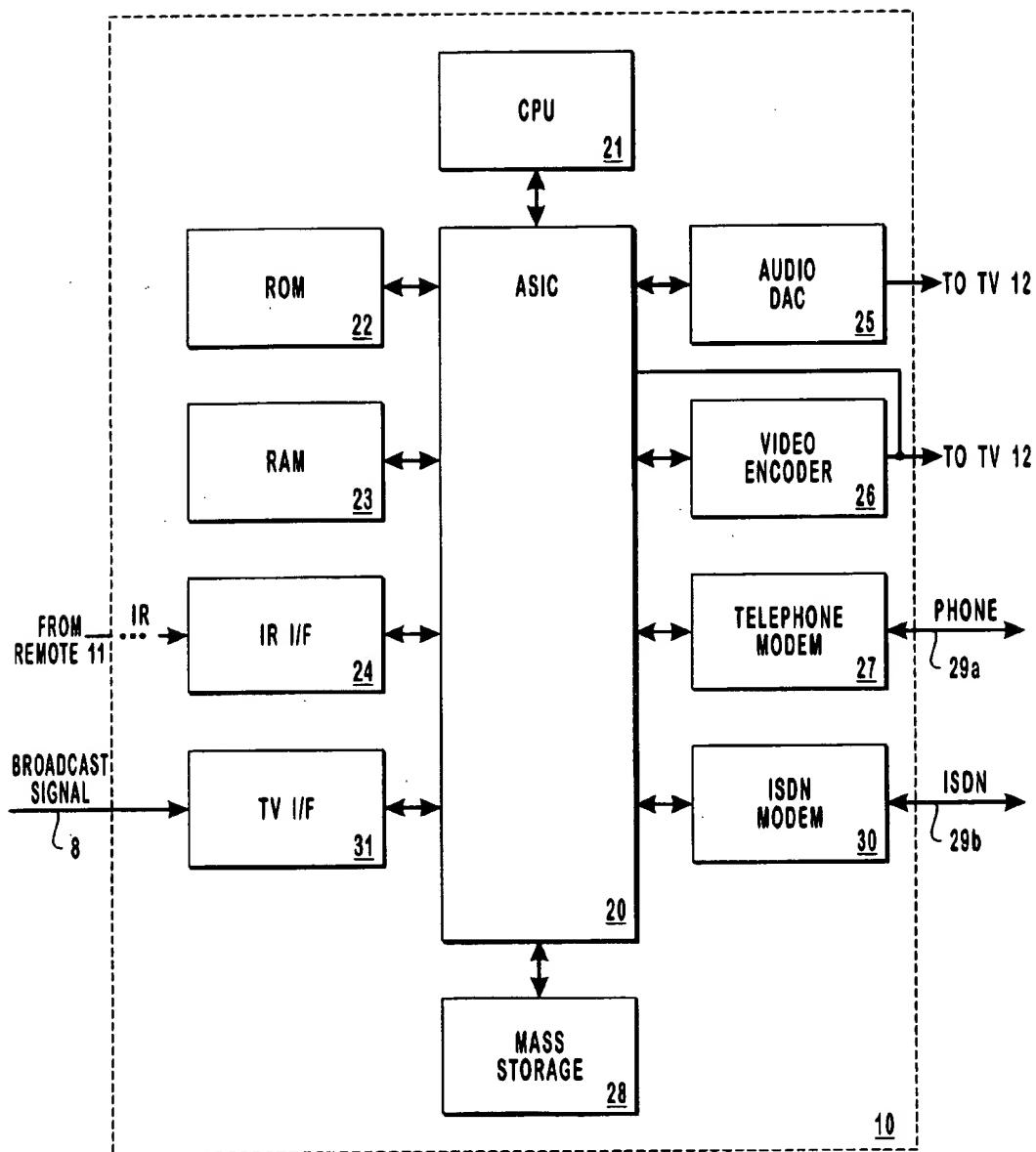


FIG. 3

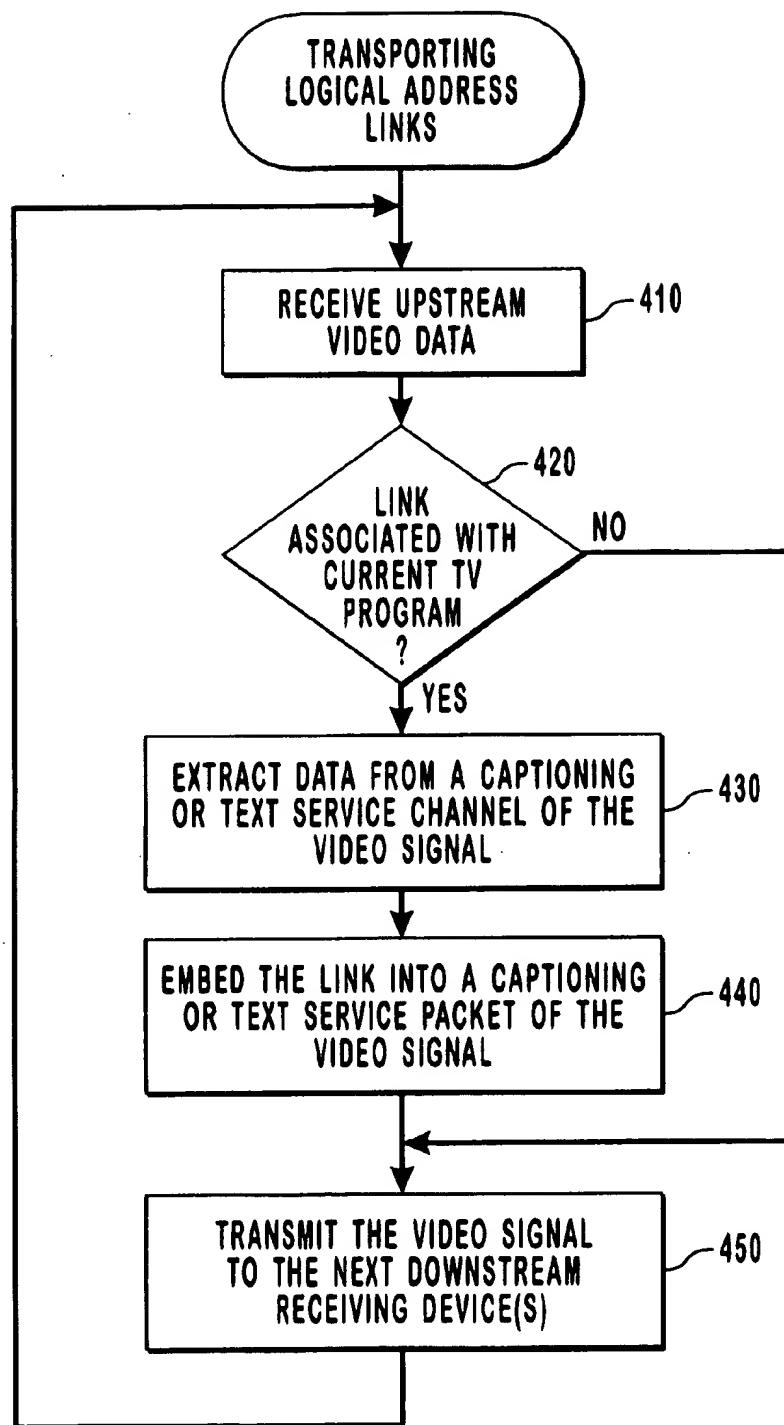


FIG. 4

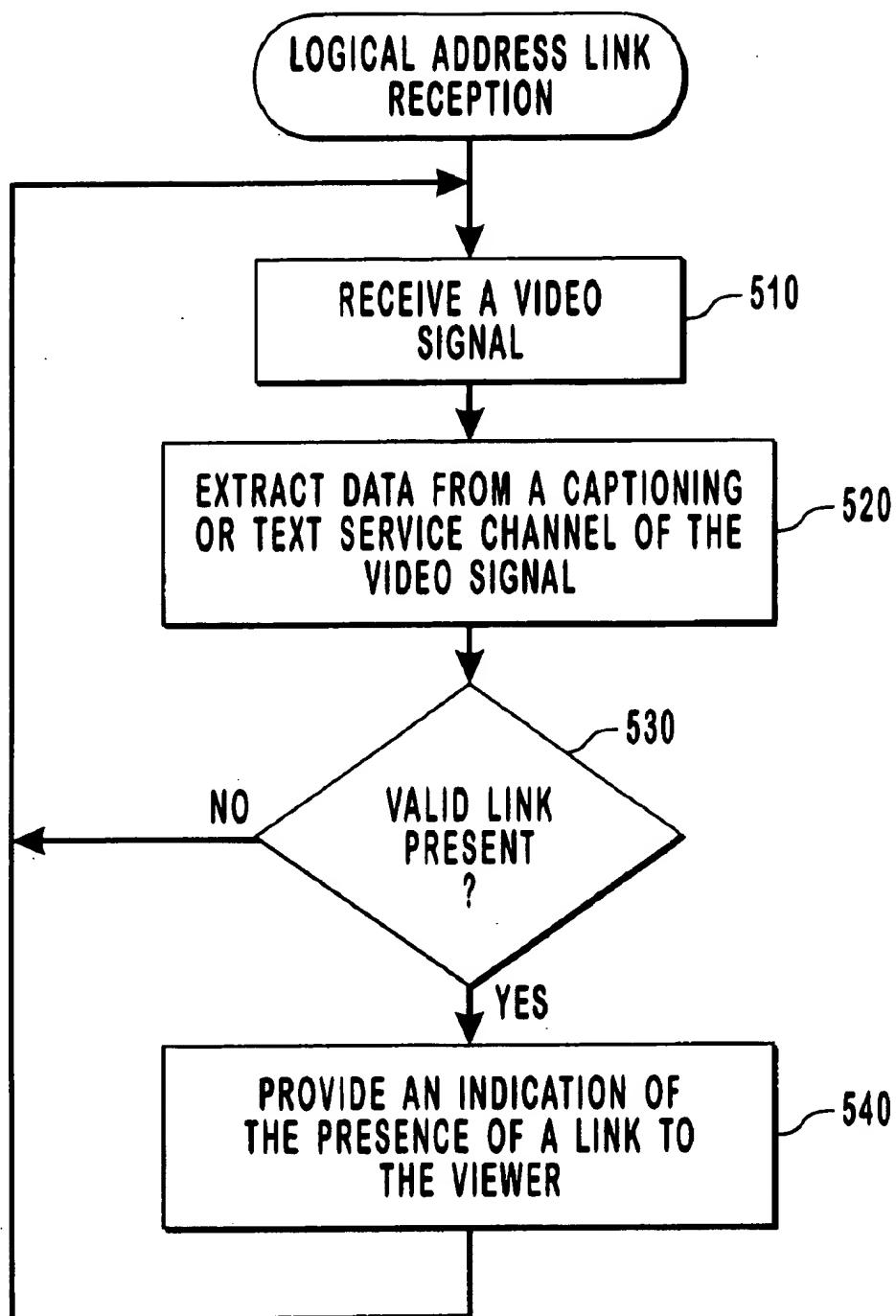


FIG. 5

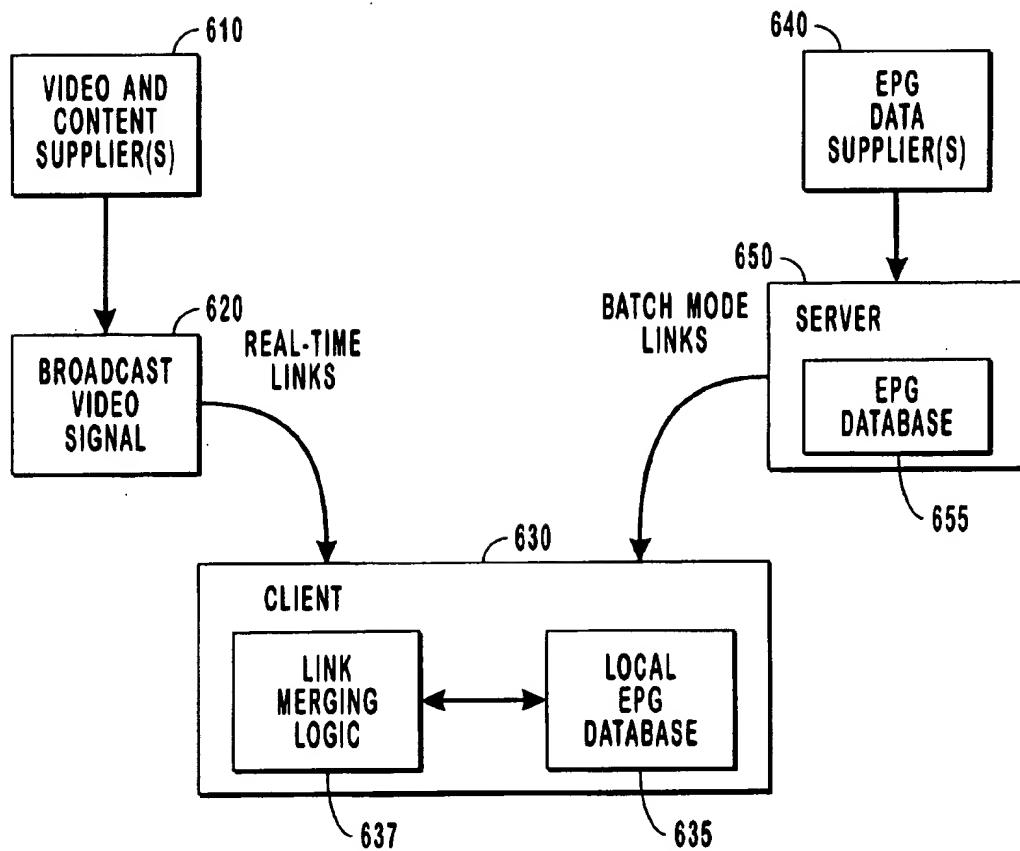


FIG. 6

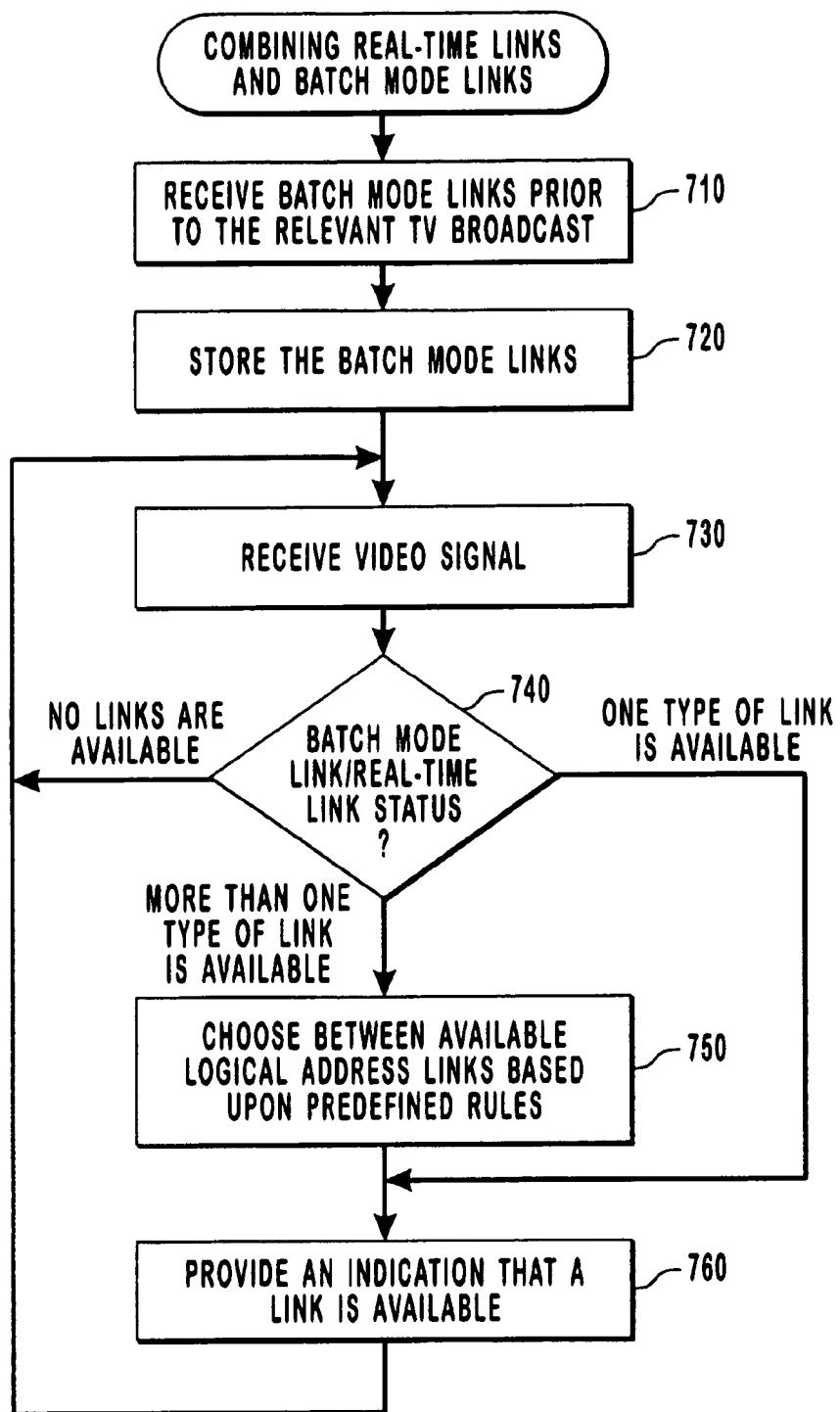


FIG. 7

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COMBINING REAL-TIME AND BATCH MODE LOGICAL ADDRESS LINKS

FIELD OF THE INVENTION

The invention relates generally to the integration of broadcast television programming with content from the Internet, World-Wide Web, Intranet, and/or other remote or local resources. More specifically, the invention relates to the reception of logical address links in advance of a television program and the combination of such links with those that may be received in real-time during a television broadcast via the vertical blanking interval.

BACKGROUND OF THE INVENTION

The World-Wide Web (the Web) is a collection of formatted hypertext pages located on numerous computers around the world that are logically connected by the Internet. The Web has become a valuable resource for information relating to almost any subject, including business, travel, education, and entertainment, to name just a few. Many Web sites include content relating to popular television programs, specific episodes, and their characters, for example. Further evidence of the Web's commercial importance is the fact that Uniform Resource Locators (URLs) have begun to appear on billboards, in newspaper and other print advertisements, and in the credits of TV programs and movies.

Traditionally, individuals have accessed Internet content from personal computers (PCs) by way of programs, such as Web browsers, that provide a graphical user interface to the Web. However, the introduction of Internet terminals, such as those pioneered by WebTV Networks, Inc., the assignee of the present invention, has made the Web accessible to a larger segment of the population by providing access to the Web without the use of a personal computer. These Internet terminals (also commonly referred to as set-top boxes) provide individuals with access to Web pages using an ordinary television (TV) set as a display and a remote control or wireless keyboard for user input.

Currently, while Internet content may be identified by a TV program or commercial, in order to view such Internet content, the TV viewer must manually key the URL into his/her Web browser or Internet terminal. It would be desirable to provide a more convenient mechanism for integrating broadcast television programming with the Web to facilitate the retrieval and viewing of Internet content concurrently with the television broadcast or at a later time at the option of the viewer. In particular, it would be desirable to provide a mechanism for notifying the viewer of the existence of Internet content relating to and/or associated with the current TV program or commercial, for example, and allowing such content to be automatically displayed upon request by the viewer.

SUMMARY OF THE INVENTION

A method and apparatus are described for receiving logical address links in advance of a television program and combining such links with those that may be received in real-time during a television broadcast. According to one aspect of the present invention, content associated with a television (TV) program may be automatically displayed by a client system. Prior to broadcast of a TV program, TV listing information is stored in the client system. The TV listing information includes one or more logical addresses that identify content, such as Internet content. The client

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system alerts the viewer of the existence of an active logical address associated with the current TV program by providing a visual indication. After the visual indication has been selected by the viewer, the client system displays the content identified by the logical address.

According to another aspect of the present invention, links to Internet content relating to a TV program may be provided to an Internet terminal. TV listing information, including one or more batch mode Uniform Resource Locators (URLs) associated with a TV program, is received from a server. The TV listing information also includes one or more of the following: program start times, program end times, and times at which the one or more batch mode URLs are active. The TV listing information is stored in the Internet terminal. Subsequently, one or more real-time URLs are received embedded in a video signal associated with the TV program. The Internet terminal determines which of the one or more real-time URLs and the one or more batch mode URLs to bring to the attention of the user of the Internet terminal based upon a set of predefined rules.

Other features of the present invention will be apparent from the accompanying drawings and from the detailed description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

FIG. 1 is a block diagram illustrating several clients connected to a server system.

FIG. 2 is a diagram illustrating a client according to one embodiment of the present invention.

FIG. 3 is a block diagram illustrating exemplary functional units of a set-top box according to one embodiment of the present invention.

FIG. 4 is a flow diagram illustrating a method of transporting logical address links according to one embodiment of the present invention.

FIG. 5 is a flow diagram illustrating logical address link reception processing according to one embodiment of the present invention.

FIG. 6 conceptually illustrates how real-time logical address links and batch mode logical address links may be combined according to one embodiment of the present invention.

FIG. 7 is a flow diagram illustrating a method of combining real-time logical address links and batch mode logical address links according to one embodiment of the present invention.

DETAILED DESCRIPTION

A method and apparatus are described for receiving logical address links in advance of a television program and combining such links with those that may be received in real-time during a television broadcast. The logical addresses may provide "links" to Internet, Web, or other local or remote content related or unrelated to a program being broadcast. A form of logical address (also referred to as a resource locator) commonly associated with Web content is a Uniform Resource Locator (URL). A URL is a compact string representation of a location used to identify an abstract or physical resource on the Internet. Of course, alternative means of uniquely identifying content may be employed. For example, it is appreciated that keys (e.g.,

database indices), network addresses (e.g., IP addresses), and other identification mechanisms, alone or in combination, may be employed to uniquely identify a resource. Therefore, while the term URL refers to a specific type of content identifier used in connection with the Web, the terms logical address and/or resource locator are used herein to refer to content/resource identification mechanisms generally.

At any rate, supplying links to Internet/Web content provides an easy and powerful way to bring the richness and interactive nature of the Internet to TV. Such links may be used by program producers, program sponsors, networks, local affiliates and other content providers to link TV viewers to Web content specifically designed to complement what the viewers are watching on TV at a given time. According to one aspect of the present invention, a TV viewer may be notified about the existence of a logical address associated with the current TV program. One or more logical addresses associated with content (e.g., Internet content) may be received and stored by a client, such as a PC or an Internet terminal. These logical addresses (referred to as batch mode logical addresses) may be received as part of TV listing information, such as an Electronic Programming Guide (EPG). When a logical address becomes active, e.g., the TV program to which it relates is currently being broadcast or the current time is past a start time associated with the logical address, then an icon or some other visual indication may be presented to the viewer to notify the viewer of the availability of content.

In addition to the batch mode logical addresses, other logical addresses may be received in real-time embedded in a video signal associated with the current TV program. Therefore, according to one another aspect of the present invention, a mechanism is provided for selecting among batch mode and real-time logical addresses based upon a set of predefined rules. Real-time logical addresses may be embedded in a video signal in accordance with an Electronic Industries Association (EIA) standard entitled, "Recommended Practice for Line 21 Data Services," approved Sep. 20, 1994 ("EIA-608") and an exemplary syntax described below. EIA-608 is incorporated herein by reference.

The present invention includes various steps, which will be described below. The steps can be embodied in machine-executable instructions, which can be used to cause a general-purpose or special-purpose processor programmed with the instructions to perform the steps. Alternatively, the steps of the present invention might be performed by specific hardware components that contain hardwired logic for performing the steps, or by any combination of programmed computer components and custom hardware components.

Importantly, while embodiments of the present invention will be described with respect to viewing Web content on an Internet terminal, such as the WebTV® Internet terminal, certain aspects of the invention have equal application to various other TV viewing devices, such as personal computers equipped with TV tuners, and the like. Additionally, the method and apparatus described herein are equally applicable to other types of content that may be stored remotely or content that may be directly accessible to the viewing system (WebTV is a registered trademark of WebTV Networks, Inc. of Palo Alto, Calif.). For example, logical addresses embedded in a video signal may refer to content stored on a CD-ROM or other mass storage device, a company's Intranet server, or other resource. Moreover, while various embodiments of the present invention will be described with reference to an NTSC broadcast video signal, aspects of the present invention are equally applicable to

other broadcast TV systems, such as Phase Alternate Lines (PAL), Sequential Couleur Avec Memoire (SECAM), and the proposed High Definition Television (HDTV) standard. Finally, it is appreciated that a variety of transport mechanisms may be employed, including analog cable, digital satellite, digital TV, and cable TV.

System Overview

Aspects of the present invention may be included in an Internet system terminal, such as the WebTV internet terminal, for providing a user with access to the Internet. As will be discussed further below, the Internet system includes an Internet terminal (also referred to as an Internet System client ("client")) and an Internet server ("server"). A user of an Internet terminal generally accesses a server via a direct-dial telephone (POTS, for "plain old telephone service"), ISDN (Integrated Services Digital Network), or other similar connection, in order to browse the Web, send and receive e-mail, and use various other Internet system network services. Services provided by the Internet system network service, such as the WebTV network, are typically provided by servers using software residing within the servers in conjunction with software residing within a client.

FIG. 1 illustrates a basic configuration of an Internet system network in which one embodiment of the present invention may be implemented. A number of clients 1 are coupled to a modem pool 2 via direct-dial, bi-directional data connections 29, which may be telephone (POTS, i.e., "plain old telephone service"), ISDN (Integrated Services Digital Network), or any other similar type of connection. Other connection mechanisms may be employed such as cable and satellite forward channels, for example. In any event, the modem pool 2 is coupled typically through a router, such as that conventionally known in the art, to a number of remote servers 4 via a conventional network infrastructure 3, such as the Internet. The Internet system also includes a server 5, which specifically supports the clients 1. The clients 1 each have a connection to the server 5 through the modem pool 2 and the Internet 3. Note that the modem pool 2 is a conventional modem pool, such as those found today throughout the world providing access to the Internet and private networks.

An Exemplary Client System

FIG. 2 illustrates an Internet system client ("client") 1 known in the art. The client 1 includes an electronics unit 10 (hereinafter referred to as "the set-top box 10"), an ordinary television set 12, and a remote control 11. In an alternative embodiment of the present invention, the set-top box 10 is built into the television set 12 as an integral unit. In the embodiment depicted, the client 1 uses the television set 12 as a display device for displaying video data and a graphical user interface. The set-top box 10 is coupled to the television set 12 by a video link 6. The video link 6 is an RF (radio frequency), S-video, composite video, or other equivalent form of video link.

The set-top box 10 includes hardware and/or software for receiving and decoding a broadcast video signal 8, such as an NTSC, PAL, SECAM or other TV system video signal, and providing video data to the television set via video link 6. The set-top box 10 also includes hardware and/or software for providing the user with a graphical user interface, by which the user can access various Internet system network services, browse the Web, send e-mail, and otherwise access the Internet. The user interface includes means for notifying the user of the presence of encoded data, such as URLs,

embedded in the video signal. The notification may be audible, visual or a combination of the two. In one embodiment, the notification comprises temporarily displaying an icon in a portion of the screen.

The client 1 may include both a standard modem and an ISDN modem, such that the communication link 29 between the set-top box 10 and the server 5 can be either a telephone (POTS) connection 29a or an ISDN connection 29b. The set-top box 10 receives power through a power line 7.

Remote control 11 is operated by the user in order to control the client 1 in browsing the Web, sending e-mail, and performing other Internet-related functions. The set-top box 10 receives commands from remote control 11 via an infrared (IR) communication link. In alternative embodiments, the link between the remote control 11 and the set-top box 10 may be RF or any equivalent mode of transmission.

Exemplary Client System Architecture

FIG. 3 is a block diagram illustrating internal features of the set-top box 10. In this example, operation of the client 1 is controlled by a processing unit, such as central processing unit (CPU) 21, which is coupled to an Application-Specific Integrated Circuit (ASIC) 20. The CPU 21 executes software designed to implement various features of the present invention. ASIC 20 contains circuitry which may be used to implement certain features provided by the client 1. ASIC 20 is coupled to an audio digital-to-analog converter (DAC) 25 which provides audio output to television 12. In addition, ASIC 20 is coupled to a video encoder 26 which provides video output to television set 12. An IR interface 24 detects IR signals transmitted by remote control 11 and, in response, provides corresponding electrical signals to ASIC 20. A standard telephone modem 27 and/or an ISDN modem 30 are coupled to ASIC 20 to provide connections 29a and 29b, respectively, to the modem pool 2 and, via the Internet 3, to the remote servers 4. Note that the set-top box 10 also may include a cable television modem (not shown).

A TV interface 31 is coupled to ASIC 20 to receive broadcast video signals, such as an NTSC video signal, and provide corresponding electrical signals to ASIC 20, thereby allowing video data carried in the broadcast video signal 8 to be presented to the viewer on the TV 12. The TV interface 31 also extracts other data that may be embedded in the video signal. The data so extracted, or a portion thereof, may be displayed concurrently with a television program. For example, in one embodiment of the present invention, titles corresponding to logical addresses that have been inserted into a text mode data service or a captioning data channel of line 21 of the VBI are extracted by the TV interface 31 and displayed on the TV 12. An exemplary syntax for transporting logical addresses in line 21 of the VBI is described below.

Also coupled to ASIC 20 is Read-Only Memory (ROM) 22, which provides storage of program code for implementing application software to be executed by the set-top box 10. Note that ROM 22 may be a programmable ROM (PROM) or any form of erasable PROM (EPROM) or Flash memory. Also coupled to ASIC 20 is Random Access Memory (RAM) 23. A mass storage device 28 may optionally be provided and coupled to ASIC 20. The mass storage device 28 may be used to input software or data to the client or to download software or data received over network connection 29 or data embedded in broadcast signal 8. The mass storage device 28 includes any suitable medium for storing machine-executable instructions, such as magnetic disks, optical disks, and the like.

Logical Address Links

Having described an exemplary environment in which embedded logical addresses may be employed, logical address links, their syntax, and usage will now be discussed. Generally, logical address links, such as TV Crossover™ Links, enable seamless integration of television programming and the Internet by allowing Internet content to be associated with a television broadcast (TV Crossover™ Links is a trademark of WebTV Networks, Inc. of Palo Alto, Calif.). In one embodiment of the present invention, the client 1 allows Web content and television programming to be concurrently displayed as described in copending patent application Ser. No. 09/087,354, entitled "Method and Apparatus for Displaying Hypertext Mark-up Language and Video Simultaneously" filed May 29, 1998 and assigned to the assignee of the present invention which is incorporated herein by reference.

Importantly, associations between a television broadcast and Internet content may be performed in real-time or in batch mode. Real-time logical address links are sent to the TV viewers client system during a television broadcast in line 21 of the VBI. In contrast, batch mode logical address links are delivered to the client system in advance of the television broadcast to which they relate. For example, batch mode logical address links may be downloaded from a Web server to the user's client system or delivered on CD-ROM ROM or other computer readable medium. According to one embodiment, batch mode logical address links are delivered as part of an electronic programming guide (EPG) and may be modified and/or supplemented with real-time logical address links. While real-time logical address links are valid for a predetermined amount of time after receipt by the client system, batch mode logical address links typically define a time interval. For example, a batch mode logical address link may include a start time and an end time indicating when the link is to be made available to the viewer.

Syntax for Logical Address Links

Logical addresses may be transmitted in one of the text service channels of line 21, i.e., First Text Service (T1), Second Text Service (T2), Third Text Service (T3), or Fourth Text Service (T4), or one of the captioning data channels of line 21, i.e., Primary Synchronous Caption Service (CC1), Special Non-synchronous Use Captions (CC2), Secondary Synchronous Caption Service (CC3), or Special Non-synchronous Use Captions (CC4), by using the following encoding format for logical address strings on line 21 of the VBI:

<logical address>[attribute₁:value₁][attribute₂:value₂]. . . [attribute_n:value_n][checksum]

The logical address (e.g., a URL) is enclosed in angle brackets. One or more pairs of attributes and values may follow the logical address in square brackets. Finally, a checksum follows the n^{th} attribute/value pair in square brackets. It is appreciated that delimiter characters other than angle brackets and square brackets may be employed. However, it is important to avoid employing delimiters that are included in the URL character set. Additionally, it is preferable that the delimiter be present in both the standard EIA-608 character set and the US-ASCII character set to make logical address links relevant to the widest set of devices.

ATTRIBUTES

Exemplary attributes include "type" and "name." The type attribute indicates to what the content associated with the URL relates. For example, the content may be related to

the current television program, to the broadcast network, or to one of the commercial sponsors of the current TV program. Table 1 lists exemplary values that may be associated with the type attribute.

TABLE 1

Type Attribute Value	Related to
PROGRAM	the current program
NETWORK	the broadcast network
STATION	the local station
SPONSOR	a commercial sponsor of the current program
OPERATOR	the service (e.g., cable or satellite) operator

The name attribute provides a concise title for the resource identified by the logical address. It is preferable to associate a title with a logical address since the logical address itself doesn't always make clear what the content of the identified resource is. For example, the URL <http://www.nbc.com/tvcentral/shows/seinfeld/characters/index.html> might identify a web page on NBC's web site that describes frequently appearing characters on the Seinfeld television program. Therefore, for the viewers' convenience, a value such as "Seinfeld Stars" may be associated with the name attribute for this logical address link. Similarly, a web page relating to guest stars, such as the web page located at <http://www.nbc.com/tvcentral/shows/seinfeld/characters/char2.html>, might be associated with the name "Seinfeld Guest Stars."

Various other attributes are contemplated by the assignee of the present invention. For example, a mechanism for purging old links may utilize an attribute that identifies a date or a date and time at which a logical address link expires. In this manner, after the date indicated, logical address links having an expires attribute may be purged from the client's memory.

Importantly, attributes are optional and need not appear in any particular order. For purposes of illustration, exemplary logical address links are listed below (note, however, the checksums have not been calculated):

```
<http://www.nbc.com/tvcentral/shows/seinfeld/characters/index.html>[name:Seinfeld Stars][A6F1]
<http://www.tvprogram.com>[type: program][name:TV Program][C8C5]
<http://advsponsor.net>[type:sponsor] [name:Special Offer][BFA0]
<http://madkad_network.com>[type:network] [1128]
<http://www.coolsite.com>[6C1D]
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Importantly, it should be appreciated that logical addresses are not limited to URLs and that URLs are not limited to the "http:" scheme. Therefore, the following would also be recognized as valid logical address links:

```
<mailto:info@advsponsor.net>[type:sponsor][5FDB]
<news:alt.tv.program>[type:program][391B]
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CHECKSUM

A checksum is appended to the end of the logical address link in order to detect data corruption that may occur during receipt or transmission of the logical address link. Preferably, a two byte hexadecimal checksum is employed such as a checksum that would be produced by the standard TCP/IP checksum algorithm described in Request For Comments (RFC) 719, "Internet Protocol", September 1981 which is incorporated herein by reference. According to one embodiment, the checksum is computed by pairing adjacent characters in the string (starting with the first delimiter) to

form 16-bit integers. If there are an odd number of characters, the final character is paired with a byte of zeroes. At any rate, the checksum is computed such that the one's complement sum of all of the 16-bit integers plus the checksum equals the 16-bit integer with all 1 bits. That is, the checksum is the one's complement of the one's complement sum of the 16-bit integers. Advantageously, in this manner, a great deal less errors go undetected than in previously suggested 7-bit checksum schemes with only a negligible increase in the logical address link's overall length.

Transmission of Logical Address Links

Referring now to FIG. 4, a flow diagram illustrating a method of transporting logical address links according to one embodiment of the present invention is illustrated. In this embodiment, logical address link data to be inserted by a content provider, e.g., a program producer, broadcaster, affiliate, cable or satellite provider, is inserted into upstream video (the source of video onto which the new data will be encoded). At step 410, upstream video data is received from a previous point in the video signal distribution path. At step 420, a determination is made as to whether or not the current distribution point has one or more logical address links that are to be associated with the current TV program being transmitted. If not, processing continues with step 450. Otherwise, processing proceeds with step 430.

Importantly, the upstream video may or may not contain previously encoded data, such as logical address links, in line 21 of the VBI. Each content provider, therefore, is a potential re-encoding point along the distribution path. At step 430, the existing data is extracted from the captioning data channel or the text service channel of the video signal. Subject to certain bandwidth limitations, the content provider then, embeds one or more logical address links into a captioning or text service packet of the video signal (step 440). Finally, at step 450, the video signal is transmitted to the next downstream receiving device(s). This process may be repeated during video signal processing at each point along the video signal distribution path.

Reception and Processing of Logical Address Links

Logical address link enabled receiving devices, such as a set-top box 10, are able to receive and process logical address links embedded in line 21 of the VBI of an NTSC video signal. FIG. 5 is a flow diagram illustrating logical address link reception processing according to one embodiment of the present invention. At step 510, a broadcast video signal, such as an NTSC video signal, is received. Video data extracted from the broadcast video signal is passed through to the display device, e.g., a TV 12 or other display device, such as a computer monitor, for presentation to the viewer.

Encoded data within a captioning or text service channel 55 of the video signal is extracted at step 520 and it is determined whether or not a valid logical address link is present (step 530). A valid logical address link is one that is encoded in a predetermined syntax, such as described earlier, and whose logical address and attribute/value pairs are not corrupted as determined by a comparison of a checksum generated by the receiving device to the checksum accompanying the logical address link. If a valid logical address link is present, then processing continues with step 540. At step 540, an indication is provided to the viewer that a logical address link is associated with the TV program currently being viewed. According to various embodiments of the present invention, the indication may be visual,

audible, or a combination of one or more audible and visual indications. For example, an icon may be temporarily displayed in one of the corners of the display area. Additionally, a tone may accompany the icon's initial presentation. It is appreciated that various other alert mechanisms are possible. In any event, continued reception and processing of the broadcast video signal and embedded logical address links may be achieved by returning to step 510. Returning to step 530, if no valid logical address link is present in the video signal, then processing loops back to step 510.

Combining Real-Time Logical Address Links and Batch Mode Logical Address Links

By providing access to both real-time logical address links and batch mode logical address links, the advantages of both can be enjoyed. Because batch mode logical address links are known in advance, the client system may pre-fetch the resources associated with the logical address links and cache them for quicker retrieval. However, batch mode logical address links are limited in that they may be outdated by the time a program is aired. For example, a sporting event may go into overtime and overlap a previously designated time slot for another program. In this case, one or more batch mode logical address links may no longer be accurate. This problem may be remedied by employing logical address merging logic to selecting between previously stored batch mode logical address links and real-time logical address links according to predefined rules as discussed further below. The situation involving outdated batch mode logical address links illustrates one of the advantages of real-time logical address links. Since real-time logical address links do not need to be scheduled as far in advance as batch mode logical address link, real-time logical address links may be more appropriate for certain content. For example, if a logical address link is to be associated with a commercial sponsor, it is useful to transport a logical address link in the VBI or the video signal during the advertisement rather than employing a batch mode logical address link and hoping the commercial will be presented at a particular time.

FIG. 6 conceptually illustrates how real-time logical address links and batch mode logical address links may be combined according to one embodiment of the present invention. Batch mode logical address links originate from EPG data suppliers 640, such as TV Data, Start Sight, Tribune Media Service (TMS), WebTV Networks, Inc., and the like. The EPG data suppliers 640 may provide TV listings and related batch mode logical address links to a server 650. The TV listing information typically contains at least program start times, program end times, and a station identifier. Depending upon the EPG data supplier, more or less information may be provided.

The server 650 maintains an EPG database 655 by receiving EPG information from multiple sources (potentially each in a different format) and translating the information into a common format. According to one embodiment, the server 650 may add further batch mode logical address links to those already present in the EPG information received from the EPG data suppliers 640. In any event, the batch mode logical address links are transmitted to the client 630 periodically or upon request by the client 630.

Real-time logical address links originate from various video and content suppliers 610, such as the program producer, the broadcaster, the local affiliate, the cable/satellite distributor, commercial sponsors, etc. The real-time logical address links are transported by inserting them directly into the broadcast video signal 620 as described above.

The client 630 includes logical address link merging logic 637 and a local EPG database 635. The logical address link merging logic 637 may represent one or more software routines that implement predefined rules to facilitate the selection between real-time and batch mode logical address links. In some circumstances, it may be appropriate to replace a batch mode logical address link with a real-time logical address link. In other situations, it may be convenient or make more sense to supplement existing batch mode logical address links with newly received real-time logical address links.

An exemplary method of combining real-time and batch mode logical address links will now be described with reference to FIG. 7. At step 710, batch mode logical address links are received by the viewer's client system. Preferably, the batch mode logical address links are received prior to any relevant TV broadcast. It is appreciated that many distribution mechanisms may be employed. For example, the batch mode logical address links may be distributed to client systems through the Internet. Alternatively, EPG data including batch mode logical address links may be distributed in electronic form on a computer readable medium, such as a CD-ROM or diskette. Regardless of the distribution mechanism employed, in the embodiment depicted, the batch mode logical address links are stored in an EPG database local to the viewer's client system (step 720). Subsequently, at step 730, during the broadcast of a video signal, one or more real-time logical address links may be received (embedded in line 21 of the VBI, for example). At step 740, the logical address link status for the current TV program is determined. In the embodiment depicted, if more than one type of logical address link is available, then processing continues with step 750. However, if only one type of logical address link is available, then processing bypasses step 750 and continues with step 760. When no logical address links are available, then processing continues back at step 730. In alternative embodiments, the status and availability of batch mode logical address links may be determined once per program prior to step 740. In this manner, indications of available logical address links may be presented to the viewer at appropriate times without having to continually access the local EPG database.

At step 750, the logical address link merging logic 637 chooses between the available logical address links based upon predefined rules. The logical address link merging logic 637 may choose to present to the user both logical address links, only the real-time logical address link, or only the batch mode logical address link. It is contemplated that batch mode logical address links may include links to information of general interest to the viewer while real-time logical address links may include links to more specific information. For example, EPG information may include a link to a Seinfeld fan club home page or other resource of general interest to Seinfeld viewers. In contrast, the real-time logical address links received during the Seinfeld episode may contain links relevant to the particular Seinfeld episode. In this example, since the real-time logical address links and the batch mode logical address links do not interfere with one another, both may be presented to the viewer.

In one embodiment, a "priority" attribute may accompany real-time logical address links to facilitate this decision making process. One priority value may indicate that the real-time logical address link defers to the batch mode logical address link (if one exists), another value may indicate the real-time logical address link overrides any existing batch mode logical address links, and a third value

may indicate that the particular real-time logical address link may coexist with any batch mode logical address links that may reside in the local EPG database 635.

After a choice has been made between the various merging options, at step 760, an indication that a logical address link is available is provided to the viewer. The merging of batch mode and real-time logical address links may continue by looping back to step 730.

In the foregoing specification, the invention has been described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. A method of automatically displaying content associated with a television (TV) program, the method comprising the steps of:

prior to broadcast of a TV program, storing TV listing information in a client system, the TV listing information including one or more URLs identifying content;

receiving at the client system one or more real-time URLs embedded in a video signal associated with the TV program;

providing an indication if a URL associated with the current TV program is active by selecting between either a real-time URL or a URL previously stored in the TV listing information; and

after the active URL indication is provided, displaying the content identified by an active URL.

2. The method of claim 1, wherein the TV listing information includes times at which the one or more URLs are active, the method further comprising the step of determining whether a URL of the one or more URLs are active based upon the current time and the times at which the one or more URLs are active.

3. The method of claim 1, wherein the step of providing an indication to the user of the client system comprises providing a visual indication to alert the user of the URL.

4. The method of claim 1, wherein the step of providing an indication to the user of the client system comprises providing an audible indication to alert the user of the URL.

5. In an Internet terminal coupled to a server system, a method of providing links to Internet content relating to a television (IV) program, the method comprising the steps of:

receiving TV listing information from a server, the TV listing information including one or more batch mode Uniform Resource Locators (URLs) associated with a TV program and one or more of the following: program start times, program end times, and times at which the one or more batch mode URLs are active;

storing the TV listing information;

receiving one or more real-time URLs embedded in a video signal associated with the TV program; and determining which of the one or more real-time URLs and the one or more batch mode URLs to bring to the attention of the user of the Internet terminal based upon a set of predefined rules.

6. The method of claim 5 wherein the set of predefined rules express a preference for real-time URL over batch mode URLs, and wherein the step of determining which of the one or more real-time URLs and the one or more batch mode URLs to bring to the attention of the user comprises selecting a real-time URL of the one or more real-time URLs.

7. The method of claim 5, further including the step of notifying the user that a URL is associated with the TV program.

8. The method of claim 7, wherein the step of notifying the user that a URL is associated with the TV program includes displaying a visual indication.

9. The method of claim 8, wherein the step of displaying a visual indication includes temporarily displaying an icon in a portion of a display device.

10. The method of claim 7, wherein the step of notifying the user that a URL is associated with the TV program includes providing an audible indication.

11. In an Internet terminal coupled to a server system, a method of providing links to Internet content relating to a television (TV) program, the method comprising the steps of:

receiving TV listing information from a server, the TV listing information including one or more of the following: program start times, program end times, one or more batch mode Uniform Resource Locators (URLs) associated with a TV program, and times at which the one or more batch mode URLs are active;

storing the TV listing information; and

providing an indication to a user of an active URL by selecting between (1) a real-time URL embedded in a video signal associated with the TV program, and (2) the one or more batch mode URLs based upon a set of predefined rules.

12. The method of claim 11, wherein the set of predefined rules define relative priorities between real-time URLs and batch mode URLs.

13. The method of claim 12, wherein real-time URLs are considered higher priority than batch mode URLs, and wherein the step of providing an indication to a user of an active URL by selecting between (1) a real-time URL embedded in a video signal associated with the TV program, and (2) the one or more batch mode URLs comprises selecting the real-time URL.

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